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HOW TO USE FABRIC DAMS

TO COMPARE EROSION

FROM FORESTRY PRACTICES

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Metric Conversion

1 inch = 2.54 cm

1 foot = 30.48 cm

1 square foot = .093 m^2

1 cubic foot = .028 m^3

1 acre = .4 ha

How to Use Fabric Dams

To Compare Erosion from Forestry Practices

by

George E. Dissmeyer

Staff Hydrologist

Since amendments to the Water Pollution Control Act (P. L. 92-500, Section 208), foresters have needed to determine the amount of erosion occuring during their treatments. Research has provided some data on this problem, and the Universal Soil Loss Equation (1) has been used to predict erosion rates for some forest management activities (2). These efforts, however, have not solved the problem for such groups as consulting foresters, forest industry, state foresters, and water-quality control agencies. These people need an inexpensive and effective means of measuring and demonstrating erosion related to forestry practices.

Demonstration forests have been proposed as a way of showing the benefits and installation of Best Management Practices (BMP's). Fabric dams are a good method of doing this because they are relatively inexpensive and easy to construct. They also trap eroded soil at the foot of the slope so people can see it and measure it. Such highly visible results make fabric dams ideal for demonstrating erosion to various groups.

The dams have several advantages over instream monitoring for sediment. Monitoring systems are time-consuming and expensive. Besides, they

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present their results in milligrams per liter, parts per million, or in a variety of other turbidity units. These concepts are unfamiliar to foresters and the general public and are therefore a poor means of explaining or demonstrating erosion.

On the other hand, fabric dams offer visible evidence for comparing site preparation practices, road design and construction standards, post-logging watershed protection treatments on roads and skid trails, and streamside management zone effectiveness. They have been used by one company in comparing site preparation practices and in identifying the practice with the least amount of erosion yet meeting tree species and site requirements.

How to Construct a Fabric Dam

The construction of fabric dams is relatively easy. The materials include a rot-resistant and water permeable fabric, treated posts, lumber, hog wire, staples, and nails. Set posts on 4- to 8-foot centers (figure 1), and into the ground 18 to 24 inches (figure 2). Brace the posts to
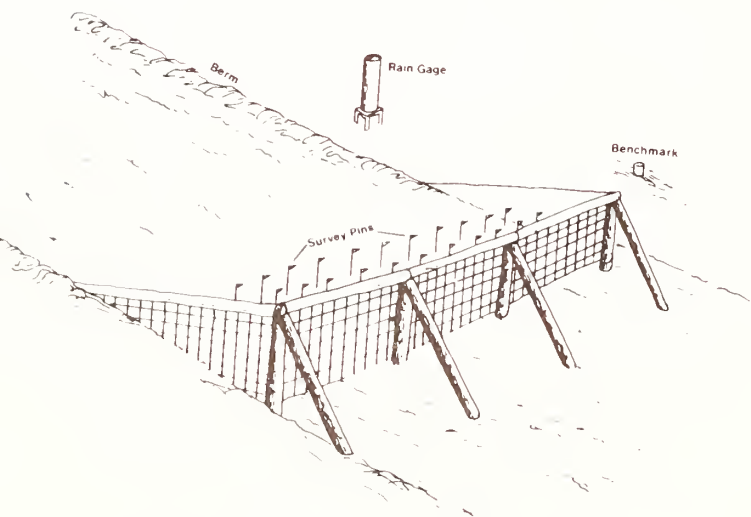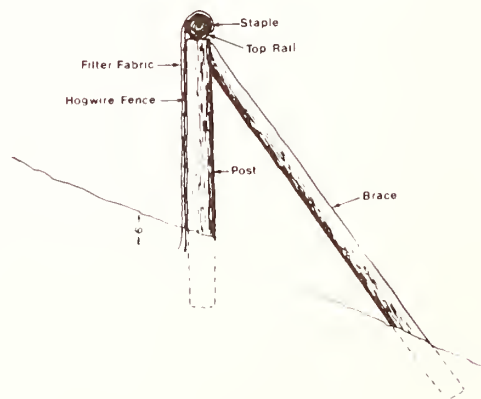
Figure 1.--Fabric dam construction

Figure 2.--Detail of fabric dam construction

prevent the weight of water and sediment from pushing over the dam. Post
height should be 2 to 3 feet above ground. Nail either a 2 X 4 inch or
round top rail to the top of the posts and dig a 6- to 10-inch deep trench
immediately upslope and adjacent to the posts. Staple hog wire to the
upslope side of the posts and top rail, and extend the wire down into the
trench. Face the upslope side of the hog wire with fabric, which you
should then wrap around the top rail and staple. You must extend the
fabric down into and across the trench bottom, then fill the trench with
soil to anchor the fabric. It is very important that the fabric be prop-
erly anchored so that water will not escape under the dam. A small leak
can develop into a large "funnel," thus rendering the dam ineffective.

The trap efficiency varies by brand and weight of fabric, but virtual-
ly all sediment is trapped. Water carrying sediment is temporarily stored
behind the dam. As the fabric allows the water to seep through, the
sediment is filtered out. The most suitable fabric depends upon the type
of soil, rainfall intensity and volumes, and plot area.

How to Compare Treatments

If you are comparing treatments, the plots must be on the same type of
soil and have the same width, slope, and slope length (figure 3). Other-
wise, direct visual comparisons between treatments will become clouded.
Sufficient space must be left between plots.

The area or plot above the dam should be small enough to keep runoff
from overtopping the structure. The plot in mechnically site-prepared
areas should not exceed 100 feet in length. Land slope should be repre-

TRAPPING ROAD OR
SKID TRAIL RUNOFF

RIDGE   LINE

TREATMENT #1

TREATMENT #2

TREATMENT #3

SIDE BY SIDE COMPARISON
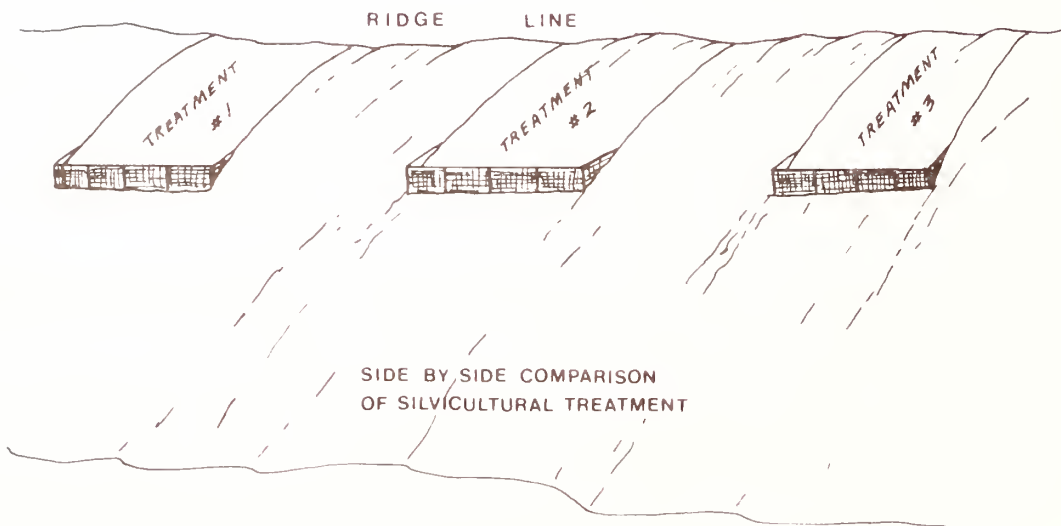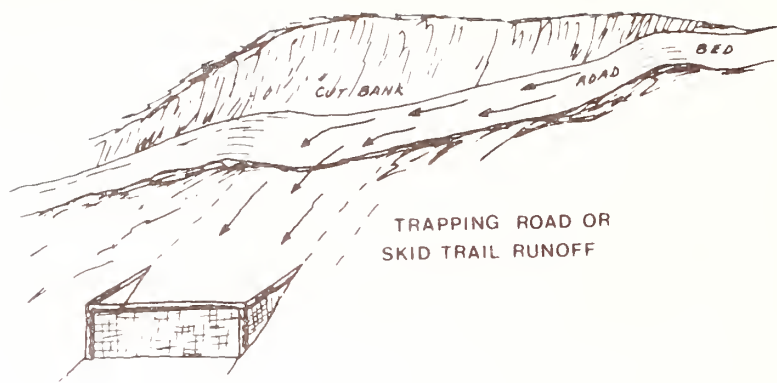OF SILVICULTURAL TREATMENT

Figure 3.--Typical side-by-side dams used for comparing silvicultural

sentative of the area being managed; however, it should not slope less
than 3 percent. The recommended plot width is 30 to 40 feet. Construct a
boundary around the plot to define the study area. The boundary can be 6-
to 8-inch flashing inserted into a slit in the ground, or a berm protected
with pine needles. It is best that the top of the plot be a ridge line.

Construction Cost

Fabric dams are inexpensive to construct. It is not possible to provide an exact cost because of variations in material and labor costs. Generally, 3-foot-high fabric dams can be built for less than $5 per linear foot, including materials and labor.

How to Measure Erosion

Two methods are available for measuring eroded soil trapped behind the dams. You may use a flagged grid, a bench mark, and a survey level. When the dam is completed, set above it flagged pins on a 1-foot by 1- or 2-foot grid (figure 4). The first row of pins should be flush against the face of the dam. Next, establish a bench mark that will remain stable in height. Then, using a survey rod and level, measure the elevation of the ground line at each pin location (figure 4).
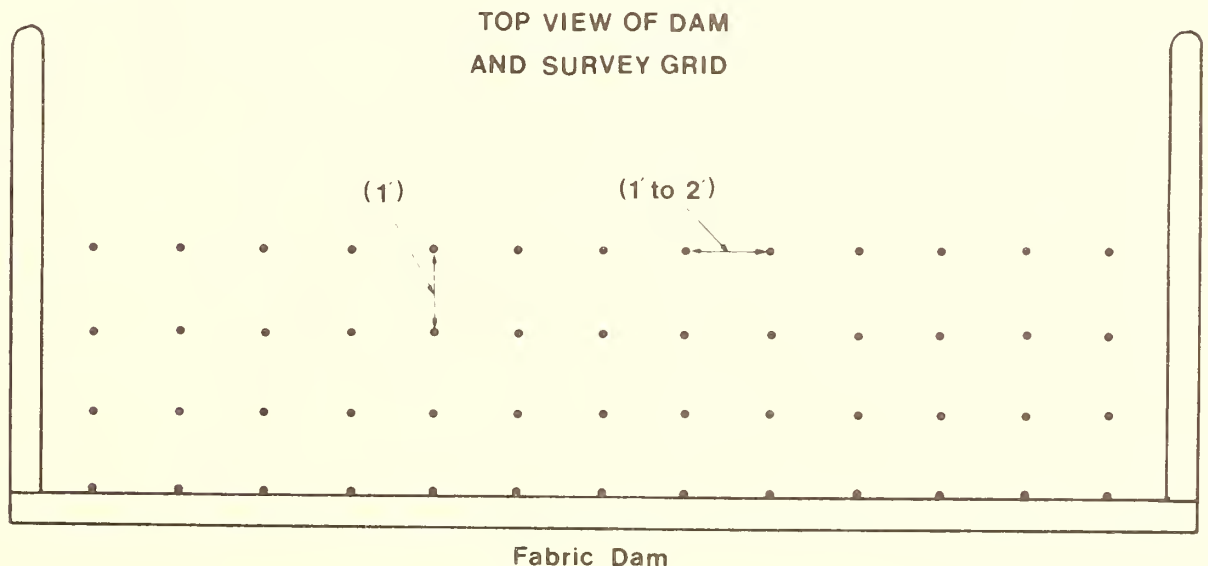
**TOP VIEW OF DAM
AND SURVEY GRID**

(1´)   (1´ to 2´)

Fabric Dam

Figure 4.--Top view of dam and survey grid

With the second method, you use the grid but not the bench mark or survey level. Use ½-inch PCV stakes with a transparent measuring tape on the sides. Drive the stakes into the ground until the zero point on the tape is at the ground level. You may then read sediment depths directly from the side of the stakes. This method clearly shows the depth of soil deposit and is an excellent means of demonstrating erosion to groups. Although you spend some time to prepare the stakes, you save significant time in measurements compared to survey level the survey level technique.

Periodically resurvey the grid to document elevation changes as eroded soil accumulates (figure 5). Using grid area, number of grid points, and the average depth of sediment, you can compute the volume of soil trapped.
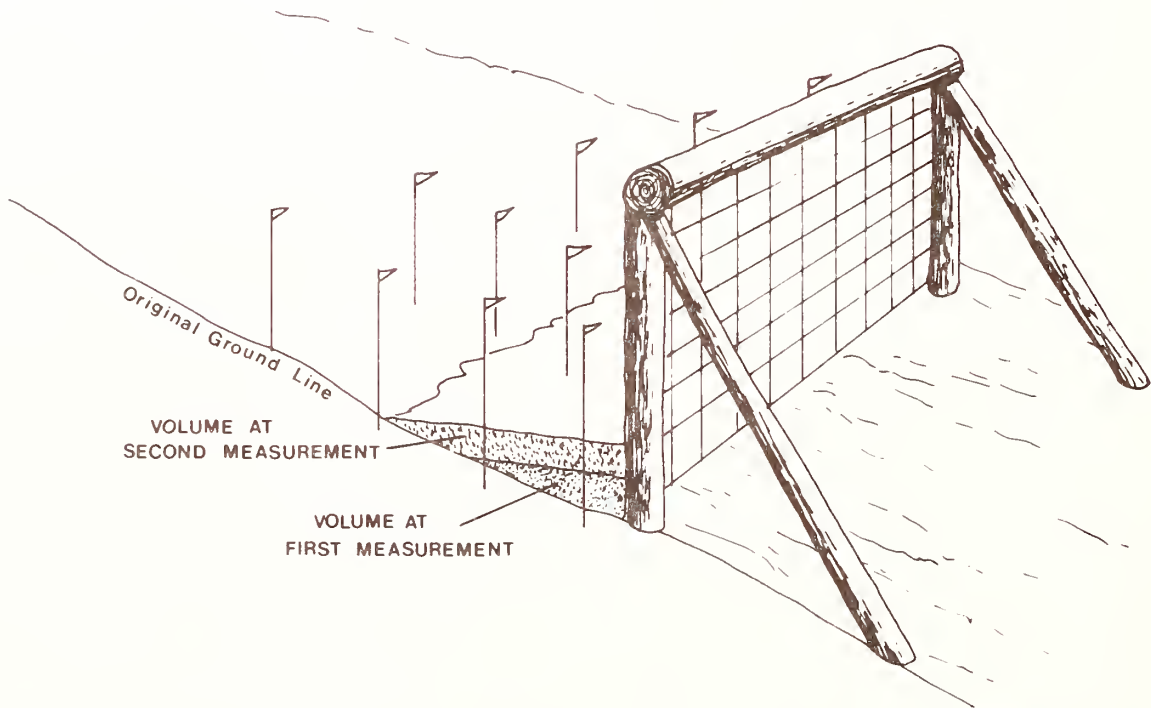

Figure 5.--Sediment accumulation with time

The grid areas is the grid length times width. Count the number of grid points for each trap, then use the following equations:

Erosion volume (cubic feet per plot) = A x P x D

A = Grid area in square feet

$$P = \frac{\text{Number of grid points with sediment deposits}}{\text{Total number of grid points}}$$

D = Average depth of sediment for grid points with deposits.

For example: The grid area is 120 square feet; 18 of 36 points showed deposits with an average depth of 0.2 feet for the 18 points.

EV = A x P x D

EV = 120 square feet x 0.5 x 0.2 feet

EV = 12 cubic feet.

Erosion volume (E) per acre equals EV divided by plot area. For this example, the plot area equals 40 X 100 feet = 4,000 square feet ÷ 43,560 square feet per acre = 0.091 acres.

E = 12 cubic feet ÷ 0.091/acre = 132 cubic feet per acre

You can convert the volume to weight by collecting an undisturbed sediment sample and determining its bulk density in pounds per cubic foot. Make an approximation if the bulk density cannot be precisely determined. Bulk density of trapped sediment is less than undisturbed soil and will approximate 80 pounds per cubic foot. For the previous example, the erosion rate is: 132 cubic feet per acre x 80 pounds per cubic foot = 10,560 pounds per acre, or 5.3 tons per acre.

Other Considerations

Because people discussing erosion studies often ask how much rainfall each plot received, you may want to include a rain gage for the demonstration area. A recording rain gage is best for measuring intensities and amounts of individual storms. But a standard rain gage is sufficient if you can measure and record the rain after storms, or at least every week.

Another question often asked is, "How much bare soil was created when the treatment was applied?" The answer to this question lies in periodic vegetation and bare soil surveys, usually taken when the sediment is remeasured. You can then compare erosion trends with vegetation trends, precipitation, seasons of the year, and other factors.

After obtaining erosion volumes, rates, and trends for various forestry practices, you can make comparisons among these practices. Such comparisons should identify the best management practice or practices for a given situation. Also, these data help to explain the significance of the sediment trapped behind the fabric dams during field demonstrations.

Sources of Fabric

Several companies produce suitable fabrics for these dams (see disclaimer). The list is not exhaustive, and some companies and products probably have been omitted. At the time of preparing this article, however, these materials were available. If planning to use one of these fabrics or any other, you should inspect them and judge which is best for your conditions.

Fabrics:

Advance Construction Specialties Co., Inc. (Fabric: Adva-Felt)
P. O. Box 17212
Memphis, Tenn. 38817
Telephone: 901/362-0980

American Enka Co. (Fabric: Stablilenka)
Enka, N. C. 28728
Telephone: 704/667-7668

Celanese Fibers Marketing Co. (Fabric: Mirafi 100X)
1211 Avenue of the Americas
New York, N. Y. 10036

E. I. DuPont (Fabric: Typar)
Textile Fibers Department
Center Road Building
Wilmington, Del. 19898

Monsanto Textiles Co. (Fabric: Bidim)
800 N. Lindberg Blvd.
St. Louis, Mo. 63166

Phillips Fibers Corporation (Fabric: Supac)
17301 N. E. 4th
Redmond, Wash. 98052

Scale Tape:

Bel-Art Products
6 Industrial Road
Pequannock, N. J. 07440
Telephone: 201/694-0500

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            ties in the Southeast. USDA For. Serv., Southeast.
            Area, Atlanta, Georgia, 26 p.

(2) Wilder, C. A. and M. T. Raines.
        1976. Site improvement techniques on the Y-LT. USDA For.
            Serv., Yazoo-Little Tallahatchie Flood Prevention
            Project, Oxford, Miss., 13 p.

(3) Wischmeier, W. H. and D. D. Smith.
        1978. Predicting rainfall erosion losses--a guide to conser-
            vation planning. Agric. Handb. No. 537, USDA, Washing-
            ton, D. C., 58 p.